

THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : James R. Kittrell Confirmation No. 3692
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Commissioner for Patents
P.O. Box 1450
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FURTHER DECLARATION UNDER 37 C.F.R. 1.132

JAMES R. KITTREL, hereby declares as follows:

That, he is the inventor of U.S. Patent Application Serial No. 09/684,173 filed October 6, 2000 for a TWO STAGE PROCESS AND APPARATUS FOR PHOTOCATALYTIC AND CATALYTIC CONVERSION OF CONTAMINANTS;

That, he has read the examiner's office action of March 8, 2007 specifically with regard to the portion entitled RESPONSE TO ARGUMENTS;

That, as further evidence supporting the unexpected results of the present invention the Declarant now offers the further test data to demonstrate the criticality of silica in combination with titania and tungsten oxide on catalyst activity;

That the following comparative test results in combination with the declarations previously submitted by Applicant on March 6, 2006 and August 23, 2006 clearly establishes the criticality of the claimed catalyst support composition of the present invention on catalyst activity.

EXAMPLE 1

An impregnated catalyst (Catalyst 1) was prepared by forming a solution of 17.5 g silicotungstic acid hydrate and 70 ml de-ionized water. The solution was impregnated in a 50g blend of a silica /titania support. The impregnated catalyst was dried and calcined at a 400 °C terminal temperature. The impregnated catalyst was then crushed and sieved. Tetraamine platinum nitrate was then added in the amount necessary to achieve a 1% platinum loading. The impregnated catalyst was dried and calcined at a 400 °C terminal temperature.

A comparison catalyst (Catalyst 2) was prepared by forming a solution of 25.7g sodium tungstate and 108 ml water. The solution was impregnated into 60g of titania support. The impregnated catalyst was dried and calcined at a 450 °C terminal temperature. The impregnated catalyst was then crushed and sieved. Tetraamine platinum nitrate was then added in the amount necessary to achieve a 1% platinum loading. The impregnated catalyst was dried and calcined at a 400 °C terminal temperature.

A third impregnated catalyst (Catalyst 3) was prepared by forming a solution of 5.17 g 12-Tungstophosphoric acid hydrate and 20.9 ml de-ionized water. The solution was impregnated in a 44.5g blend of a silica / titania support. The impregnated catalyst was dried and calcined at a 300 °C terminal temperature. The impregnated catalyst was then crushed and sieved. Tetraamine platinum nitrate was then added in the amount necessary to achieve a 1% platinum loading. The impregnated catalyst was dried and calcined at a 300 °C terminal temperature.

Each catalyst was placed individually in a tubular reactor having an outer diameter of 15.8mm. A typical reactor charge of catalyst crushed and sieve was 10-15cc. The temperature of the reactors was controlled by a PID micro mega controller. Each reactor had an arrangement for the introduction of the air stream containing organic contaminant and the removal of the purified air stream.

Air was supplied to the reactors by an air compressor. All or a portion of the air could be diverted through a saturator to add tert-butyl methyl ether (MTBE) to the stream to obtain the desired reactor inlet concentration. The temperature of this jacketed saturator was controlled by circulation through the jacket of a glycol stream from a temperature controlled Lauda Refrigerating Circulator Bath. By control of the saturator air flow rate and the saturator temperature, any desired concentration of contaminant can be achieved in the main air flow stream to the thermo catalytic reactor. The total air flow to the reactor was maintained by a flow controller.

An air stream at about 25°C, containing about 10 ppm of MTBE at about 25% relative humidity was introduced into each glass reactor at about 1 atm. pressure and passed through the reaction zone. In one reactor, approximately 10 cm³ of Catalyst 1 of a size range of 8 to 12 mesh was inserted in the reaction zone of the glass reactor. In the second reactor, approximately 15 cm³ of Catalyst 2 of a size range of 8 to 12 mesh was inserted into the reaction zone of the reactor. In the third reactor, approximately 10 cm³ of Catalyst 3 of a size range of 12 to 20 mesh was inserted into the reaction zone of the reactor. At steady state, the reactor outlet was analyzed for the concentration of unreacted MTBE.

The results are as follows:

Catalyst	Tungsten Oxide, Wt %	Silica, Wt %	Titania, Wt %	Catalyst Activity, min ⁻¹	Space Velocity Hours ⁻¹	MTBE Conversion, %	Reaction Temperature, °C
Catalyst 1	16.25	37.3	46.4	2692	129,000	71.4	60
Catalyst 2	23.44	0	69.3	20	16,000	7.1	59
Catalyst 3	10	59	30	9728	141,600	98.4	60

In combination with the other examples previously submitted, the results are surprising, and show that there is an extremely strong dependence of catalyst activity on the relative amounts of silicon and titania in the catalyst. It is clear that the silica is necessary for a significant reaction rate to occur. The catalyst of present invention contains silica, tungsten oxide, titanium, oxygen, and platinum. With five components, it is not possible to predict, or even to determine by routine experimentation, the proper combination of the amounts of each of these five constituents, particularly when such changes in composition of silica cause such large effects on catalyst performance.

The foregoing test data clearly establishes the criticality of the claimed catalyst support composition of the present invention on catalyst activity. The sum total teachings of the cited prior art documents does not appreciate the advantages obtained by providing a catalyst composition of the independent claim nor the benefits obtained on catalyst activity resulting from even small amounts of silica in combination with titania and tungsten oxide. High amounts of silica are also effective, as long as proper proportions of tungsten oxide and titania are present.

The undersigned declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

July 25, 2007
Date

James R. Kittrell
James R. Kittrell

JAMES R. KITTRELL, PRESIDENT
Name & Title